REMARKS

Claims 26, 71, and 77 have been amended. Claims 26-32, and 71, and 77 are pending. Applicant reserves the right to pursue the original claims and other claims in this and other applications. Please reconsider the above-referenced application in light of the foregoing amendments and following remarks.

Claim 71 stands rejected under 35 U.S.C. § 112, second paragraph as being indefinite. The rejection is respectfully traversed. Claim 71 has been amended to recite a "plasma etchant mixture consisting of CF_4, at least one other fluorocarbon, and NH_3." The Examiner's approval is solicited.

Claims 26-32, 71, and 77 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,935,877 ("Autryve"). The rejection is respectfully traversed.

The cited reference does not teach Applicant's claimed composition as recited in claims 26, 71, and 77. Specifically, Autryve does not disclose "a flowing plasma etchant mixture consisting of at least one fluorocarbon and ammonia, wherein said at least one fluorocarbon and ammonia form a reactive mixture," as recited in claim 26, or "a plasma etchant mixture consisting of CF_4, at least one other fluorocarbon, and NH_3, wherein said CF_4, at least one other fluorocarbon, and NH_3 form a reactive mixture," as recited in claim 71, or "a gaseous etchant mixture consisting of at least one fluorocarbon and ammonia, wherein said at least one fluorocarbon and ammonia form a reactive mixture," as recited in claim 77.

Support for these claim amendments can be found in Applicant's specification, pg. 10, lines 19-20. Specifically, "the device shown in Figure 3 has a self-aligned contact opening 27 that is formed without etch stop problems [with] the

reactant mixture of fluorocarbon(s) and ammonia." Autryve does not disclose a plasma or gaseous etchant mixture that forms a reactive mixture used to eliminate etch stop problems.

Admittedly, Autryve may disclose a plasma etch process comprising a mixture of a nitrogen-containing gas and one or more other fluorine-containing etch gases. Autryve, however, does not disclose Applicant's claimed composition that is a reactive mixture. For example, Autryve discloses that "[i]n the case of nitrogen-containing etchant gases, they are *not* considered a 'nitrogen-containing gas' within the purview of the present invention because they would *add to the etchant activity* and significantly modify the original recipe programmed process." Col. 4, lines 42-47) (emphasis added). In other words, Autryve requires that "one or more fluorine-containing etchant gases [are] used in combination with a *nonreactive* nitrogen containing gas in the practice of the process of the invention." (Col. 4, lines 48-50) (emphasis added).

Although Autryve discloses that a nitrogenous gas such as N_2, N_2O, NO, NO_2, NH_3, and N_2H_4 can be used, the nitrogenous gas that is used must be one that does "not modify the originally programmed etching process: that is, the reactive species generated from the decomposition of such a nitrogen-containing gas in the plasma does not add to, modify, or alter the originally programmed etching process." (Col. 5, lines 49-57). Accordingly, if the nitrogen-containing gas is used, it must be "non-disruptive of the original etch process." (Col. 5, lines 58-60). This makes it non-reactive.

The addition of Autryve's nitrogen-containing gases was believed to assist in achieving formation of inorganic nitrides with metallic silicide compositions. Thus, the presence of the nitrides renders the silicide layer less sensitive and substantially

decreased the silicide layer's normal rate of etch for an untreated surface (Col. 5, lines 20-23). In other words, Autryve's etchant mixture creates an inorganic nitride polymer that protects and prevents a silicide layer from being etched. This is desirable in Autryve. However, applying Applicant's claimed composition prevents a polymer layer from forming, *i.e.*, an etch-stop layer.

Applicant's claimed composition is used to form a "reactive mixture" which is used to form a self-aligned contact opening without etch stop. In the Background of the Invention, Applicant discloses that "[a] build up of polymer layer 29 at the bottom of the SAC opening 27 can cause an undesirable phenomenon known as 'etch stop', in which further etching through the insulative layer 21 to the surface of the substrate 12 is prevented by this polymer layer build up 29." (Applicant's specification, pg. 3, lines 5-8, and FIG. 2). As a result, the "etch stop polymer 29 formed from the insulative layer can significantly inhibit suitable formation of the contact opening 27 (Applicant's specification, pg. 3, lines 8-10, and FIG. 2). This is the exact polymer that Autryve's etchant composition produces.

This fact is underscored by Applicant's further disclosure in the Background of the Invention. Specifically, Applicant's acknowledge that "[n]itrogen (N_2) has also been used for cleaning residual debris after the etching process." (Applicant's specification, pg. 3, lines 19-20, and FIG. 2). In the prior art, during an etching process, "one or more fluorocarbons are introduced into a chamber containing the semiconductor device 10," and N_2 was added; but, still yielded a polymer layer 29 at the bottom of opening 27 (Applicant's specification, pg. 2, line 19 through pg. 3, line 2, and FIG. 2). This is undesirable in forming a self-aligned contact opening in a semiconductor structure.

Applicant's claimed composition addresses these shortcomings in the prior art. Applicant's claimed composition provides a reactive mixture that completely etches through the etch-stop polymer layer. Autryve, in contrast, discloses that the addition of nitrogen-containing gas must be 'nondisruptive' to the fluorine-containing gas etchant portion. Autryve's nitrogen-containing gas should not "add to, modify, or alter the originally programmed etching process." (Col. 5, lines 55-57). In other words, Autryve's etching process is conventional until the silicide layer is reached in a structure, in which a nitrogen-containing gas is added, that is non-reactive with the fluorine-containing gas, to form a polymer on the silicide for protection.

Moreover, Applicant's are not broadly claiming a nitrogen-containing gas; but, a composition consisting of ammonia (NH_3) and at least one fluorocarbon which forms "a reactive mixture," as recited in claim 26. A specific mixture "consisting of CF_4, at least one other fluorocarbon, and NH_3 . . . [which forms] a reactive mixture," as recited in claim 71. Similarly, a specific gaseous mixture "consisting of at least one fluorocarbon and ammonia . . . [which forms] a reactive mixture," as recited in claim 77. Accordingly, Applicant's claimed composition, which is a reactive mixture that removes and prevents a polymer layer from forming, *i.e.*, an etch-stop layer, is completely different from Autryve's 'nondisruptive' mixture that forms a polymer.

Claims 27-32 depend from claim 26 and should be similarly allowable for at least the reasons provided above with regard to claim 26, and on their own merits.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

By _____

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